IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Rainer Porzel et al.		
Filing Date:	May 25, 2007		
Application No.:	10/593,789	Examiner:	Jeffery A. Shapiro
		Group Art Unit:	3653
Title:	"Hydraulic Actuating Device for an Automotive Friction Clutch"	Docket No.	1784.3034.001
		Patents	

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Electronically Filed:

December 28, 2011

Dear Sir:

PROPOSED AMENDMENT

Pursuant to the Office Action dated September 13, 2011, Applicants propose to amend the above-identified patent application as follows for discussion at the upcoming telephone interview at 2:00 p.m. on Wednesday, December 28, 2011:

IN THE CLAIMS

Claims 1-19 (Cancelled)

20. (Currently Amended) A hydraulic actuating device for an automotive friction clutch comprising:

a master cylinder having a master piston, which can be ~~impinged upon with~~ subjected to a master force (F_G) via an actuating mechanism and can be displaced by a master travel (s_G) as master variables, and

a slave cylinder with a slave piston which is hydraulically connected in series to the master piston ~~via a liquid column, which is functionally linked with~~ said slave piston being actually connected to a clutch-release member of the automotive friction clutch,

~~wherein there is provided an adjusting unit and a control unit,~~

~~said~~ an adjusting unit ~~comprising~~ which has an adjusting piston ~~hydraulically connected with the master piston by one out of being connected in series and parallel thereto,~~ which can be ~~impinged upon with~~ subjected to a force and displaced via a transmission that is driven by an electric motor,

~~wherein said control unit can control the electric motor subject to one of the master variables (F_G, s_G) and a variable (F_A) substantially proportional thereto, in order~~

~~in the case of the connection~~ is arranged in series [[of]] between the master piston and the ~~adjusting~~ slave piston so that the force acting on the slave portion of the liquid column can be increased in a defined manner by subjecting the adjusting piston to force via the

~~transmission, specifically to increase the force acting on the liquid column by impinging the adjusting piston with a force, and~~

~~in the case of the parallel connection of the master piston and the adjusting piston specifically to increase the volume of the liquid column by displacement of the adjusting piston~~ , and divides the liquid column between the master piston and the slave piston into a master portion between the master piston and the adjusting piston and a slave portion between the adjusting piston and the slave piston,

a control unit that controls the electric motor,

a first sensor device which is signal-connected to the control unit and by which a master pressure (p_{actual}) in the master portion of the liquid column or the master force (F_{actual}) can be detected as control variable, and a second sensor device which is signal-connected to the control unit and by which a slave travel (s_{actual}) of the slave piston, an adjusting travel (s_{actual}) of the adjusting piston, the master travel (s_{actual}) of the master piston or a variable proportional thereto can be detected as guide variable, wherein the control unit as a memory element in which a desired curve ($p_{nominal} = f(s_{actual})$; $F_{nominal} = f(s_{actual})$) of the control variable (p_{nom}, F_{nom}) relative to the guide variable (s_{nom}, s_{S}, s_{st}) is stored, from which an associated nominal value for the control variable ($p_{nominal}$, $F_{nominal}$) can be determined for each actual value of the guide variable ($s_{Nactual}$, $s_{Sactual}$, $s_{Sactual}$) detected by the second sensor device, so that a nominal value for the master pressure ($P_{nominal}$) or the master force ($F_{nominal}$) can be determined in the control unit as a function of the detected slave travel ($S_{Sactual}$), adjusting travel ($s_{Sactual}$), master travel ($s_{Sactual}$) or the detected variable proportional thereto, and wherein the determined master pressure ($p_{nominal}$) or the determined master force ($F_{nominal}$) can be set via the electric motor of the adjusting unit which is controlled by the

control unit.

Claims 21 - 40 (Cancelled)

40. (New) An actuating device for a motor vehicle friction clutch, comprising a master cylinder, the master piston of which, via an actuating member, can be subjected to a master force (F_C) and can be displaced by a master travel (s_C) as master variables, a slave cylinder which has a slave piston hydraulically connected in series to the master piston, said slave piston being actively connected to a clutch-release member of the motor vehicle friction clutch, an adjusting unit which has an adjusting piston which can be subjected to force and displaced via a transmission that is driven by an electric motor, wherein the master piston is arranged between the adjusting piston and the slave piston for the hydraulic series connection of the master piston and the adjusting piston and divides a liquid column between the adjusting piston and the slave piston into a servo portion between the adjusting piston and the master piston and a pressure portion between the master piston and the slave piston, a control unit, by which the electric motor can be controlled, so that the force acting on the pressure portion of the liquid column can be increased in a defined manner by subjecting the adjusting piston to force via the transmission, a first sensor device which is signal-connected to the control unit and by which the master force ($F_{Cactual}$) can be detected as control variable, and a second sensor device which is signal-connected to the control unit and by which a slave travel ($s_{Nactual}$) of the slave piston, the master travel ($s_{Cactual}$) of the master piston, an adjusting travel ($s_{Sactual}$) of the adjusting piston or a variable proportional thereto can be detected as guide variable, wherein the control unit has a memory element in which a desired curve ($F_{Cnominal}$ =

$f(s_{Gactual})$ of the control variable (F_G) relative to the guide variable (s_N; s_G; s_S) is stored, from which an associated nominal value for the control variable ($F_{Gnominal}$) can be determined for each actual value of the guide variable ($s_{Nactual}$; $s_{Gactual}$; $s_{Sactual}$) detected by the second sensor device, so that a nominal value for the master force ($F_{Gnominal}$) can be determined in the control unit as a function of the detected slave travel ($s_{Nactual}$), master travel ($s_{Gactual}$), adjusting travel ($s_{Sactual}$) or the detected variable proportional thereto, and wherein the determined master force ($F_{Gnominal}$) can be set via the electric motor of the adjusting unit which is controlled by the control unit.

41. (New) An actuating device according to claim 20, wherein the master piston is biased by a return spring into a basic position in which a pressure chamber of the master cylinder is hydraulically connected to a reservoir.

42. (New) An actuating device according to claim 41, wherein the adjusting piston is also biased by a biasing spring into a basic position in which a pressure chamber of the adjusting unit is hydraulically connected to a reservoir.

43. (New) An actuating device according to claim 42, wherein the transmission of the adjusting unit is a spindle drive.

44. (New) An actuating device according to claim 44, wherein the electric motor of the adjusting unit is a brushless DC motor.

45. (New) An actuating device according to claim 40, wherein the master piston is biased by a return spring into a basic position in which a pressure chamber of the master

cylinder is hydraulically connected to a reservoir.

46. (New) An actuating device according to claim 43, wherein the adjusting piston is also biased by a biasing spring into a basic position in which a pressure chamber of the adjusting unit is hydraulically connected to a reservoir.

47. (New) An actuating device according to claim 46, wherein the transmission of the adjusting unit is a spindle drive.

48. (New) An actuating device according to claim 47, wherein the electric motor of the adjusting unit is a brushless DC motor.

49. (New) An actuating device for an automotive friction clutch, with

a master cylinder, the master piston of which can be impinged upon with a master force (F_G) and can be displaced by a master travel (S_G) as master variables via an actuating member,

a slave cylinder comprising a slave piston which is hydraulically connected in series to the master piston via a liquid column, and which is functionally linked with a clutch-release member of the automotive friction clutch, wherein the master cylinder is hydraulically connected to the slave cylinder by a first pressure line, in which the liquid column between the master piston and the slave piston is displaceable,

an adjusting unit comprising an adjusting piston hydraulically connected parallel to the master piston, which can be impinged upon with a force and displaced via a transmission that can be driven by an electric motor, wherein, for parallel connection of the master piston and the adjusting piston, the adjusting unit is hydraulically connected via a second pressure line to the first pressure line.

a control unit, by which the electric motor can be controlled, so that by displacement of the adjusting piston via the transmission the volume of the liquid column between the master piston and the slave piston can be increased in a defined manner,

a first sensor device with a signal connection to the control unit, by which the master travel (S_{Gist}) can be detected as a reference value,

a second sensor device with a signal connection to the control unit, by which an adjusting travel (S_{Sist}) of the adjusting piston or a slave travel (S_{Nist}) of the slave piston can be detected as a control variable, and

wherein the control unit comprises a computation element, by which a desired value for the adjusting travel (S_{Ssoll}) or the slave travel (S_{Nsoll}) can be determined according to the following relationship: S Ssoll = k U ss S Gist or S Nsoll = k U ss S Gist

$$S_{Ssoll} = k_U * S_{Gist} \quad \text{OR} \quad S_{Nsoll} = k_U * S_{Gist}$$

where

S_{Gist} is the master travel of the master piston detected by the first sensor device and

k_U is a transformation factor stored in a storage element of the control unit, and wherein the adjusting travel (S_{Ssoll}) or slave travel (S_{Nsoll}) determined can be adjusted via the electric motor of the adjusting unit which is controlled by the control unit.

50. (New) An actuating device according to claim 49, wherein the transformation factor (k_U) is constant.

51. (New) An actuating device according to claim 50, wherein the master piston is pretensioned in a basic position by a return spring, in which position the pressure chamber of the master cylinder is hydraulically connected to a reservoir.

52. (New) An actuating device according to claim 49, wherein the transmission of the adjusting unit is a spindle drive.

53. (New) An actuating device according to claim 49, wherein the electric motor of the adjusting unit is a brushless DC motor.

54. (New) An actuating device for an automotive friction clutch, with a master cylinder , the master piston of which can be impinged upon with a master force (F_G) and can be displaced by a master travel (s_G) as master variables via an actuating member, a slave cylinder comprising a slave piston which is hydraulically connected in series to the master piston, and which is functionally linked with a clutch-release member of the automotive friction clutch,

an adjusting unit comprising an adjusting piston which can be impinged upon with a force and displaced via a transmission that can be driven by an electric motor, which, for a connection in series of the master piston and the adjusting piston, is arranged between the master piston and the slave piston, and which divides a liquid column between the master piston and the slave piston into a master section between the master piston and the adjusting piston and a slave section between the adjusting piston and the slave piston,

a control unit, by which the electric motor can be controlled, so that by impinging a force upon the adjusting piston via the transmission the force acting on the slave section of the

liquid column can be increased in a defined manner,

a first sensor device with a signal connection to the control unit, by which a master pressure (p_{Geber}) in the master section of the liquid column or the master force (F_{Geber}) can be detected as a control variable,

a second sensor device with a signal connection to the control unit, by which a slave pressure (p_{Nehm}) in the slave section of the liquid column can be detected as a reference value, wherein the control unit comprises a computation element by which a desired value for the master pressure (p_{Geber}) or the master force (F_{Geber}) can be determined according to the following relationship:

$$p_{Geber} = 1/k_V * p_{Nehm} \quad \text{or} \quad F_{Geber} = A_G/k_V * p_{Nehm}$$

where

p_{Nehm} is the slave pressure in the slave section of the liquid column detected by the second sensor device,

k_V is an amplification factor stored in a storage element of the control unit and

A_G is the hydraulic effective area of the master piston, wherein the control unit further has a correction element by which, with an increasing wear of the clutch, the amplification factor (k_V) can be increased in a defined manner, so that an operator, upon engaging or disengaging the clutch, always perceives the same reaction force response on the actuating member, independent of the clutch wear, and

wherein the master pressure (p_{Geber}) determined or the master force (F_{Geber}) determined can be adjusted via the electric motor of the adjusting unit which is controlled by the control unit.

55. (New) An actuating device according to claim 54, wherein, by the correction element of the control unit, the amplification factor (k_v) can be corrected in accordance with the following relation subject to the clutch wear:

$$k_v = k_{vo} * (p_{Nmax0} + \Delta p_{Nmax}) / p_{Nmax0}$$

wherein

$$\Delta p_{Nmax} = p_{Nmaxist} - p_{Nmax0}$$

where

k_{vo} is a fixed amplification factor stored in the storage element of the control unit for an non-worn clutch,

p_{Nmax0} is a fixed value stored in the storage element of the control unit for a maximum slave pressure in the slave section of the liquid column with a non-worn clutch and

$p_{Nmaxist}$ is the maximum slave pressure detected in the slave section of the liquid column by the second sensor device.

56. (New) An actuating device according to claim 54, wherein the master piston is pretensioned in a basic position by a return spring, in which position the pressure chamber of the master cylinder is hydraulically connected to a reservoir.

57. (New) An actuating device according to claim 56, wherein the adjusting piston is also pretensioned in a basic position by a pretensioning spring, in which position a pressure

chamber of the adjusting unit is hydraulically connected to a reservoir.

58. (New) An actuating device according to claim 54, wherein the transmission (of the adjusting unit is a spindle drive.

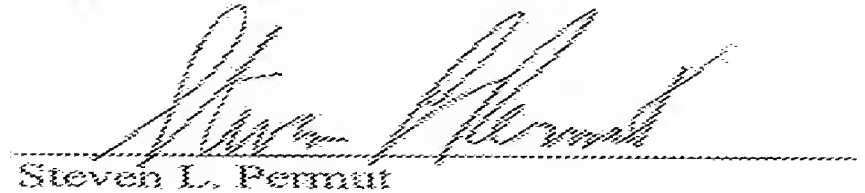
59. (New) An actuating device according to claim 54, wherein the electric motor of the adjusting unit is a brushless DC motor.

REMARKS

These claims are proposed to place this case is in condition for allowance.

Respectfully submitted,

REISING ETHINGTON P.C.



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